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NOTES ON CLIMATOLOGY.

BY

ROBERT DEC. WARD.

THE PLAGUE AND CLIMATIC CONDITIONS.—At the December meeting of the Royal Meteorological Society (London), Mr. Baldwin Latham, M.Inst. C.E., read a paper on *The Climatic Conditions necessary for the Propagation and Spread of Plague*. Mr. Latham believes that the bubonic plague, which is primarily due to a specific organism or microbe so small that probably 250 millions of them would be required to cover a square inch of surface, is greatly influenced by pestilential emanations from polluted and water-logged soils. The author gives accounts of various outbreaks of plague in England and other countries, including the great plague of London in 1665, when 7,165 deaths were recorded in one week in September. Plague is undoubtedly a disease of the poor, and attacks most readily those living on low diet. That the ground itself exercises an influence upon plague is shown by the fact that, in all the epidemics, persons living on the ground floors suffer to a much greater extent than those living on the upper floors of houses. Mr. Latham says that there can be no doubt that the conditions which ordinarily produce evaporation from water or land surfaces are identical with those which produce exhalations from the ground, and these exhalations consist largely of vapor of water, carrying matters injurious to health. The author has discussed the meteorological observations (including the temperature of the soil at depths of 9, 20, 60 and 132 inches) made at the Colaba Observatory, Bombay, and has compared them with the number of deaths from plague during the recent epidemics in Bombay. He says that if the temperature of the air increases beyond the temperature of the ground, so that its dew-point is above the temperature of the ground, condensation takes place instead of evaporation. To this increased high temperature may be due the sudden stoppage of plague after a certain high temperature has been reached, which, by raising the temperature of the dew-point, stops all exhalation from the ground and may cause condensation to take place instead of evaporation. So also a sudden fall of temperature causes plague to arise, for a fall of temperature means that the temperature of the

dew-point must fall, and the tensional difference between a low dew-point and a high ground temperature would at once lead to exhalations from the ground, and so to the liberation of the plague bacillus from the ground, accompanied by the exhalations necessary for its development.

This question of the relation between the plague and climatic conditions, one aspect of which is considered in Mr. Latham's paper, is one which is by no means settled. While it used to be thought that the plague could not occur in the Torrid Zone, it is now known, in view of outbreaks of the disease within the tropics in Arabia and India, that this rule does not hold rigidly. In Egypt the autumn seems to be the season in which the plague appears, and June the month in which it dies out. In Europe, outside of Turkey, the plague season has been summer and autumn. In India no direct connection with the seasons could be detected in the epidemics of 1815-21 (the first outbreak concerning which we have trustworthy information) and of 1836-38. From all the data at hand, the general conclusion is that a moderately high temperature favors the development and extension of the plague, but extremes of heat and cold are unfavorable to its breaking out. Exceptions to this rule are many. For instance, in the epidemic at Smyrna, in 1735, the heat was so excessive during the plague that many of the people who left the town for neighboring villages died of sunstroke on the way; while in Roumelia, in 1737-38, the plague continued in many places in which the temperature fell at times to 3° Fahr. Regarding the effect of atmospheric moisture there is also some doubt. Some authorities hold that a high degree of humidity is necessary for the epidemic extension of the plague, while others maintain the opposite view. Certainly the occurrence of many outbreaks at high altitudes in Kurdistan, Arabia, China and India makes it clear that a moist atmosphere is not always an essential in the spread of the epidemic. Again, in the present outbreak of plague in India, a station at an altitude of 14,000 feet in Russian Turkistan has been visited by the disease, and over one-half of the inhabitants died before medical assistance was sent there. At this place, Augzap, the climate is both cold and dry, and very different from the hot, moist climates near sea-level.

THE RAINY SEASON CAMPAIGN IN THE PHILIPPINES.—In the *Journal of School Geography* for December an article by R. DeC. Ward discusses the climate of the Philippine Islands, and calls attention to some of the more important relations of these climatic

conditions to man. It is inevitable that so strong a contrast between different parts of the year as that between the rainy and dry seasons in the Philippines should exercise marked controls over the customs, occupations and general conditions of life of the inhabitants of the islands. In this connection the article referred to says:

"Our chief interest in this seasonal control over human activities in the Philippines has, since last May, been centered in the bearing of the past rainy season upon the military campaign which our troops have been carrying on in those new possessions of ours. Anyone with even the vaguest ideas as to what a tropical rainy season is, would certainly never have expected that an active aggressive military campaign could be carried on by white troops during the months from June to October. Yet under date of May 29th last, a press despatch from Manila, printed in all our leading newspapers, made the emphatic statement that the commanding general at Manila 'says the campaign against the Filipino insurgents will be prosecuted by the American forces with the utmost aggressiveness possible during the rainy season. We will show the insurgents by vigorous action on the rivers, lakes and mountains that their belief that we cannot campaign in the rainy season or in the mountains is untrue.' That this proposed active campaign has not been carried out everyone who has read our newspapers through the past summer knows full well.

"The difficulties that have beset our troops in the Philippines since the beginning of the rains are now familiar to Americans. With the roads deep in mud or overflowed with water, so that marching became extremely difficult, if not altogether impossible, the sufferings of the men under the oppressive moist heat were surely terrible. Cases of prostration by the heat and of sunstroke were very frequent, far more so than the strict censorship of the press at Manila has led people here to suppose. In one press despatch it was said (April 28th): 'If the American troops were not fighting the heat as well as the rebels, they might pursue the natives until they compelled them to scatter in the mountains, but the soldiers are so wilted that they must rest.' The buffaloes used to drag the guns and camp wagons succumbed to the heat in large numbers. After a day's march in drenching rains, through mud so deep and so sticky that it was often impossible to pull their legs out after taking a step, and with water up to their waists, our men frequently had advanced but seven or eight miles, or at the rate of about one mile an hour. The Manila correspondent of the *Army and Navy Journal* (New York), in a letter published July 8th, says: 'The rain has been falling almost continuously. The whole country is flooded. The trenches at San Fernando are ditches of water and the mud is knee-deep in the temporary camps at several of the outlying towns.' The same writer in a letter published July 22d, says: 'Manila resembles an Arkansas town after a spring freshet. The heavy rains, which have amounted thus far to more than 30 inches in July, have converted the streets into waterways, and boats have been doing a merry commerce from street to street. Where a few days ago was heard the booted foot-fall of the American sentry, arises the splash of paddle and oar. The surrounding country is equally flooded, and the American soldier now knows what campaigning in a rainy season means.'

"These quotations must suffice to give a general idea of the conditions under which troops have to live during a Philippine rainy season. That an aggressive campaign cannot be carried on under these conditions is perfectly clear. Even the Army officers themselves, who boasted of their ability to proceed just the same in the summer months as in the winter, have now been compelled to acknowledge their

mistake. It is interesting, in connection with the press despatch of May 29th, above referred to, to note that the *Army and Navy Journal* for October 14th, p. 139, says: 'No one expected much activity * * * * during the rainy season.'

METEOROLOGY OF HAVANA IN 1898.—The following data relating to temperatures and rainfall at Havana during the year 1898 have been compiled for these NOTES from the *Observaciones Magnéticas y Meteorológicas del Observatorio del Colegio de Belén de la Compañía de Jesús en la Habana, Año de 1898*.

Mean monthly temperatures: January, 72.3° ; February, 70.0° ; March, 73.0° ; April, 75.7° ; May, 77.9° ; June, 80.6° ; July, 81.0° ; August, 80.6° ; September, 80.4° ; October, 78.1° ; November, 76.5° ; December, 72.5° .

Mean annual temperature: 76.5° . Absolute maximum temperature: 91.4° , in August. Absolute minimum temperature: 54.0° , in January.

Mean relative humidity: 74.7%. Maximum monthly relative humidity: 82% in October. Minimum monthly relative humidity: 67.9%, in March.

Monthly rainfall: January, 0.02 in.; February, 2.02 in.; March, 1.06 in.; April, .86 in.; May, 1.38 in.; June, 2.95 in.; July, 5.79 in.; August, 6.74 in.; September, 5.63 in.; October, 11.20 in.; November, 1.87 in.; December, .24 in. Total rainfall for the year: 39.76 in.

Comparing these data for 1898 with the means derived from 10 years' observations, 1888-1897, by Prof. H. A. Hazen, it appears that the year 1898 had very nearly the average annual temperature. The warmest month, July, was 1.4° cooler than the average for that month, and the coolest month was February, with 70.0° , whereas January is usually the coolest, with a mean of 70.3° . The annual rainfall in 1898 was about 12 inches less than the average rainfall based on the 10 years' record.

THE WEATHER AND THE DAIRY.—A point of some economic importance in connection with the effect of our winter cold upon the amount and quality of the milk given by cows has recently been noted in the *Monthly Weather Review* of the U. S. Weather Bureau. In general, it appears that there is a decided diminution in the yield of milk and in the cream as soon as the weather turns cold. The practice of some dairymen of keeping their barns artificially heated during the cold weather thus finds abundant justification. Furthermore, the practice of allowing cattle to stay in the fields or open pens all night during the winter months is productive of great

loss to the farmers of the Southern States. The food given to the animals goes first of all towards the maintenance of life and animal heat, and the surplus only goes to the production of increased flesh and milk. A fall in temperature cuts off this surplus. Some records made at a Texas station during a "Norther" show that the first effect of the cold was to increase the yield of butter, but the continued effect was to decrease both butter and milk by 20%, and the cows did not recover for several days after the cold weather. If ice-cold water is given to cows, there is a fall of 6% to 8% in the yield of milk as compared with that when the drinking water is warm. This subject has lately been studied by Mr. E. A. Evans, of the Virginia State Weather Service, the results of whose investigations have been summarized in the foregoing statements.